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Current Infection Control Trends in Audiology

by

Alison Burco

**A Capstone Project
submitted in partial fulfillment of the
requirements for the degree of:**

Doctor of Audiology

**Washington University School of Medicine
Program in Audiology and Communication Sciences**

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**Approved by:
A.U. Bankaitis, PhD, Capstone Project Advisor
Robert J. Kemp, MBA, Second Reader**

***Abstract: The purpose of this study is to provide an in-depth assessment of
current infection control practice trends in a group of practicing audiologists.***

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CHAPTER I:

Introduction

Infection Control

Infection control refers to the conscious management of the environment for the purposes of minimizing or eliminating the potential spread of disease (Bankaitis and Kemp, 2003a). This process involves the development, implementation, and the execution of profession-specific protocols designed to reduce potential cross-contamination in the clinical environment. The effectiveness of an infection control program depends not only on the degree to which protocols meet infection control guideline criteria, but the extent to which such procedures are followed.

Over the past decade, the topic of infection control has been addressed by audiology organizations. For example, the American Academy of Audiology (AAA) issued practice guidelines to its membership, addressing the importance and the need for implementing infection control procedures in clinical practice (Clark, Kemp, and Bankaitis, 2003). Despite such increased interest in the topic, the extent to which audiologists appreciate the need for infection control or the importance of integrating infection control principles in the clinical environment remains unknown.

Importance of Infection Control to the Profession of Audiology

Originally outlined by Bankaitis and Kemp (2003a, 2003b), there are several reasons why infection control must be implemented by audiologists in the clinical environment. By law, audiologists are legally as well as ethically obligated to implement infection control protocols in the clinic. During the AIDS epidemic throughout the 1980's, the Occupational Safety and Health

Administration (OSHA) was instrumental in developing guidelines for protecting healthcare workers from cross-infection of HIV and other bloodborne diseases. OSHA mandates, oversees, and enforces infection control programs. Random visits and inspections of healthcare facilities are performed by field inspectors to ensure that facilities are in compliance with regulations. Citations and fines can be assigned to the facility if there is a failure to comply with regulations.

The nature of audiological practice involves a significant degree of direct and indirect contact with multiple patients and objects (Bankaitis and Kemp, 2003a; 2003b). For example, audiologists come in direct contact with patients during a variety of clinical procedures such as otoscopy, which involves touching and pulling on the pinna, or electronystagmography (ENG), whereby audiologists must guide patients into different test positions, to name a few.

Furthermore, audiologists use and reuse test equipment including headphones and listening stethoscopes across many different patients or manipulate objects removed from patients' external auditory canals such as immittance probe tips or hearing instruments/earmolds. These types of daily clinical activities increase the risk of cross-contamination and the importance of infection control procedures cannot be overlooked.

The scope of practice in audiology has significantly changed over the past several decades. Many audiologists are now involved in procedures that could potentially cause exposure to blood and other bodily fluids (e.g. intraoperative monitoring, vestibular testing). Furthermore, clinicians dispensing hearing instruments and/or conducting cerumen removal are at an increased risk of coming in contact with blood or blood byproducts, thereby increasing the risk of exposure to bloodborne pathogens increases (Bankaitis and Kemp, 2003a; 2003b). In addition, it is common for audiologists to be exposed to cerumen during standard diagnostic and/or rehabilitative procedures. Cerumen is a bodily substance that is considered potentially

infectious when contaminated with blood, blood byproducts, mucous, and/or ear drainage (Bankaitis and Kemp, 2003a; 2003b). Since it is not possible for the audiologist to determine the content of cerumen, cerumen must be treated as an infectious agent. As such, infection control procedures during cerumen management or when handling hearing instruments and other tools, equipment or accessories contaminated with cerumen are very critical.

Finally, patients seeking the services of audiologists vary across several parameters such as age, nutritional status, exposure to past and current pharmacological interventions, and socioeconomic status (Bankaitis and Kemp, 2003a; 2003b). Individually, each parameter influences the overall integrity of the immune system and the concern for opportunistic infections increases. Opportunistic infections result from ever-present organisms residing in abundance throughout the environment that can cause threatening conditions in patients who are immunocompromised (Bankaitis, 2002). The organisms that would not cause illness in healthy persons cause illness in those who are immunocompromised due to their susceptibility.

In the confines of the audiology clinic, cross-contamination with microorganisms associated with opportunistic infections remains a realistic concern. As shown by Bankaitis (2002), light to heavy amounts of bacterial and/or fungal growth were recovered from hearing aid surfaces. While some of the recovered microbial organisms were considered part of the ear canal's normal flora (i.e. *Staphylococcus*), other microbial growth was not (i.e. *Acinetobacter lwoffii*, *Lactobacillus*, *Pseudomonas aeruginosa*, *Enterobacter*, *Aspergillus flavus*, and *Candida parapsilosis*). Audiologists handling hearing instruments without applying necessary infection control procedures inherently increase the potential for disease transmission to occur. For example, manipulating multiple hearing instruments with unwashed, bare hands will cross-contaminate each instrument. Reinsertion of these contaminated hearing instruments into a

patient's ear canal provides microorganisms with an easy portal of entry into the human body. Under the right conditions, such contaminated objects could lead to the development of an opportunistic infection that can manifest at the level of the ear canal or gain access into the body causing a systemic disease.

In an update to the Bankaitis (2002) study, Sturgulewski and colleagues (2006) investigated not only the microbial growth found on hearing aids in general, but also the composition of microbes found on hearing aids worn by the same subject. In this investigation, twelve subjects' hearing aids were sampled. Of these twelve, half were bilateral hearing aid wearers; the other half only wore one hearing aid. It was found that the majority of aids (82%) were contaminated with at least one bacterium. *Coag Neg Staphylococcus* was found on 71% of the hearing aids. *Coag Neg Staphylococcus* is a generic term that refers to all *staphylococcus* species that are not identified as *S. aureus*. *Coag Neg Staphylococcus* is omnipresent in the environment; however, when it comes into contact with a patient with a weakened immune system it can cause serious infection and disease. Nearly one-third were contaminated with two or more independent bacteria. Additionally, there was unidentified fungal growth found on 24% of the hearing aids. Of the bilateral hearing aid wearers, five of the six hearing aid pairs had different bacterial and/or fungal growth that differed between the two ears. This shows that cross contamination may be a concern even when dealing with only one patient. Opportunistic infections result from ever-present organisms residing in abundance throughout the environment that can cause threatening conditions in patients who are immunocompromised. The organisms that would not cause illness in healthy persons cause illness in those who are immunocompromised due to their susceptibility.

Infection control principles & requirements

As previously mentioned, OSHA was instrumental in developing infection control guidelines in an effort to ensure a safe workplace to health care practitioners and patients. OSHA's standards were based on universal precautions originally issued by the Centers of Disease Control and Prevention (CDC). The CDC has been involved in the field of infection control, issuing various recommendations and guidelines for purposes of minimizing cross-infection of bloodborne diseases to healthcare workers. The basis of the CDC's guidelines stems from the underlying principle that every patient must be considered a potentially carrier of an infectious disease and/or a susceptible host for potentially infectious microorganisms (Kemp and Bankaitis, 2000; Bankaitis and Kemp, 2003a; 2003b). The CDC's guidelines were officially formalized in the mid to late 1980's as the Universal Blood and Bloodborne Pathogen Precautions (CDC, 1987). Originally intended to protect healthcare workers against potential exposure to blood, the precautions have since been extended to safeguard workers not only from blood-borne substances, but other potentially infectious bodily substances (Bankaitis and Kemp, 2003a; 2003b).

More commonly referred to as Standard Precautions, the CDC's universal precautions are comprised of five general points as follows:

1. *Appropriate personal barriers (gloves, masks, eye protection, and gowns) must be worn when performing procedures that may expose personnel to infectious agents.*
2. *Hands must be washed before and after every patient contact and after glove removal.*
3. *"Touch" and "splash" surfaces must be pre-cleaned and disinfected.*
4. *Critical instruments must be sterilized.*
5. *Infectious waste must be disposed of appropriately*

CDC, 1987

With these guidelines in mind, OSHA requires that practitioners (i.e. audiologists) develop work practice controls that integrate the CDC's universal precautions. Work practice controls refer to

profession-specific procedures that have been implemented for the purpose of minimizing the risk of disease transmission (Bankaitis and Kemp, 2003a, 2003b). In other words, audiologists are required to assess current clinical procedures and to appropriately alter these procedures as needed to ensure universal precautions are met. Work practice controls must be developed, implemented, and applied to each and every patient, regardless of the healthcare status of the individual. Employees must consistently apply the procedures across all patients.

To better illustrate the concept of work practice controls, the following section addresses the five universal precautions with examples of how common audiology procedures should be altered to meet infection control requirements.

Universal Precautions: Guideline One

Appropriate personal barriers (gloves, masks, eye protection, and gowns) must be worn when performing procedures that may expose personnel to infectious agents.

Gloves

Appropriately-fit gloves, either latex or non-latex, should be worn during invasive procedures where open wounds and/or visible blood are present. Gloves are indicated anytime hands are likely to come into contact with potentially infective materials, such as blood, bodily fluids, or secretions. Additionally, gloves should be worn when there is a risk of encountering infectious substances is high. As elaborated by Bankaitis and Kemp (2003a; 2003b), gloves should be worn in the audiology clinic when handling earmolds or hearing aids, removing or handling earmold impressions, when cleaning or disinfecting instruments contaminated with

cerumen or other bodily substances, or when submersing or removing instruments into or from cold sterilant.

Protective Apparel

When there is a risk of splash or splatter of potentially infectious material or when there is risk of airborne contamination, masks and safety glasses should be worn. Masks should be worn when in contact with Tuberculosis (TB) or immunocompromised persons who may be at risk for droplet contact. Gowns should be worn when performing vestibular testing as a safeguard to protect clothing in the event the patient becomes nauseous.

Universal Precautions: Guideline Two

Hands must be washed before and after every patient contact and after glove removal.

Hand hygiene is the single most important procedure for effectively limiting the spread of infectious disease (Bankaitis and Kemp, 2003a; 2003b; CDC, 2002). This can be a challenge to those audiologists who may not have easy access to sinks with running water. Antimicrobial “no rinse” hand degermers can be effectively used when traditional hand washing is not convenient. When traditional hand washing is utilized, skin must be washed by vigorously rubbing hands together to clean hands, wrists, and lower forearms. Medical grade liquid antibacterial soap that contains emollients to protect hands from drying is recommended. The use of this type of soap is recommended for people who wash their hands more frequently than the average person as the special emollients prevent chapping from frequent hand washing (Bankaitis and Kemp 2003a, 2003b).

Hand hygiene should take place after the following circumstances, but is not limited to only these instances:

- Prior to initial contact with patient, at the beginning of the patient appointment
 - At the end of the patient contact
 - After glove use, immediately after removing the gloves
 - Prior to eating, drinking, smoking, application of lotion or makeup
 - After eating drinking, smoking, application of lotion or makeup
 - After use of the bathroom facilities
 - At any time it is felt necessary and appropriate
- (Bankaitis and Kemp, 2003a; 2003b)

Universal Precautions: Guideline Three

“Touch” and “splash” surfaces must be pre-cleaned and disinfected.

Touch surfaces are areas that potentially come into direct or indirect contact with hands, either by the patient or by the audiologist (Bankaitis and Kemp, 2003a; 2003b). Touch surfaces could include tables, armrests of chairs, service areas, workbenches, or counter tops. Splash surfaces are areas that could be hit with blood, bodily fluids, or secretions from a potentially contaminated source.

Cleaning is the removal of gross contamination from surfaces or objects without killing germs (Bankaitis, 2005a, 2005b; Bankaitis and Kemp, 2003a; Kemp and Bankaitis, 2000).

Cleaning must be done before disinfecting or sterilization in order for these actions to be effective. Disinfecting is a process whereby germs are killed (Bankaitis 2005a, 2005b; Bankaitis and Kemp, 2003a). The level of disinfection depends on how many and which germs are killed. For example, hospital grade disinfectants kill a wide variety of microbes, whereas household disinfectants kill a limited number of germs (Bankaitis and Kemp, 2003a, 2003b). Disinfecting surfaces that do not make contact with blood or other potentially infectious substances is acceptable.

Universal Precautions: Guideline Four

Critical instruments must be sterilized.

Sterilization is the killing of 100% of vegetative microorganisms including endospores (Bankaitis, 2005a, 2005b; Bankaitis and Kemp, 2003a; Kemp and Bankaitis, 2000). Critical instruments are those instruments or objects that are placed directly into the bloodstream (e.g., needles), non-invasive instruments that come in contact with intact mucous membranes or bodily substances (e.g., blood, saliva, pus, mucous discharge), or instruments that could possibly penetrate the skin from use or misuse. Non-critical instruments are those instruments that either do not ordinarily touch the patient or touch on the externally intact skin. In the audiology clinic, reusable instruments that come into contact with cerumen are intended to be used with multiple patients should be sterilized. These include curettes used in cerumen removal and reusable otoscope specula.

There are two sterilization techniques: the autoclave and cold sterilization. The autoclave is a pressurized heat used to sterilize. In most instances, audiology instruments would melt, thus this process is not the most appropriate. Cold sterilization involves the soaking of instruments in EPA-approved liquid chemicals for a specified span of time. The only EPA-approved chemicals for cold sterilants are glutaraldehyde solutions in concentrations of 2% or higher or 7.5% or higher level of hydrogen peroxide (H_2O_2) (Bankaitis and Kemp, 2003a, 2003b). Before beginning the cold sterilant process, all instruments need to be thoroughly cleaned in order to remove organic material.

Universal Precautions: Guideline Five

Infectious waste must be disposed of appropriately.

Materials which present sufficient potential risk of causing infection during handling or disposal for which some special precautions would be sensible should be identified. Special precautions apply to microbiology laboratory waste, pathology waste, blood specimens or products, or sharp instruments such as needles, razorblades, or scalpel blades. The CDC states that items that have made contact with blood or bodily fluids could be infectious; however, it is not necessary to treat these items as infectious waste (CDC, 2002; Bankaitis and Kemp, 2003a).

Within the audiology clinic, waste contaminated with ear discharge or cerumen can be placed into the regular waste receptacles and discarded with regular waste procedures. In cases where there is excessive amount of cerumen or mucous contamination of the waste, the material should be placed within a separate, impermeable bag and then placed in the regular waste receptacle. This practice will minimize the chance of the maintenance or cleaning personnel of coming into casual contact with the material. In the unlikely event where there are significant amounts of blood, the materials should be placed in impermeable bags labeled with the biohazard waste symbol and disposed of by a waste hauler who is licensed for medical waste disposal (Bankaitis and Kemp, 2003a; 2003b).

Written Infection Control Plan

Finally, each facility is required to have a written infection control plan. This plan must be made available to all employees and must provide protocols to be used in the office for infection control. This written plan is the foundation of all infection control programs.

The plan requires six main sections as follows:

1. Employee Exposure Classification
2. Hepatitis B (HBV) Vaccination Plan and Records of Vaccination
3. Plan for Annual Training and Records of Training
4. Plan for Accidents and Accidental Exposure Follow-up
5. Implementation Protocols
6. Post-Exposure Plans and Records

Current Infection Control Practice Trends:

The audiology clinic can be categorized as having a high probability of cross-infection. The literature assessing infection control practice trends within the audiology clinic is limited with the most comprehensive study conducted by Amlani (1999). Amlani investigated the infection control of practices of audiologists. A five page questionnaire was completed by 311 members of the American Academy of Audiology (AAA). Based on the findings of this study, more than two-thirds of the audiologists believed that their setting did not have a high exposure to communicable diseases. While 51% of the respondents were reportedly aware of federally-mandated infection control requirements set forth by OSHA, 41% indicated that their particular work setting did not integrate Universal Precautions into clinical practice. When questioned about infection control nomenclature, while the majority of respondents (74%) reported that they understood the difference between standard infection control terms such as cleaning, disinfecting, and sterilization, the actual results indicated the contrary. For example, only 55% of the respondents were able to correctly identify the definition of disinfection. A greater percentage correctly identified the definitions of cleaning (73%) and sterilization (93%).

Amlani's (1999) study further explored infection control trends, asking questions specifically pertaining to reported infection control procedures currently practices by

participating subjects. Surprisingly, only 26% of the respondents reported washing hands between patient appointments although the percentages increased based on the specific clinical procedures performed. For example, nearly 50% of respondents reported washing their hands following cerumen removal procedures. In addition, 63% reported washing hands after earmold impression procedures. Interestingly, all of the respondents (100%) reported hand washing after coming into contact with a bodily fluid.

In terms of using appropriate protective barriers, a very small percentage of respondents indicated that gloves were used during cerumen management or evoked potential procedures with none of the respondents incorporating the use of gloves during vestibular testing or earmold impression procedures. Taking into consideration the lack of hand washing found in this study, the degree in which audiologist appropriate apply basic infection control procedures is concerning.

Respondents were also questioned about current disinfecting and sterilization procedures. Based on Amlani's findings, it was evident that a majority of the respondents were not appropriately disinfecting or sterilizing objects that should have been disinfected or sterilized prior to re-use. For example, a combined 12% reported disinfecting or sterilizing otoscope specula after use. Since otoscope specula are inserted in the ear canal and come in contact with ear canal skin, cerumen and related cerumen by-products (blood, blood by-products, ear drainage, pus, etc.), these instruments must be sterilized prior to reuse. In other words, it is possible as many as 88% of audiologists reportedly reused contaminated instruments during standard otoscopic procedures. Unfortunately, it is unclear whether or not this question was skewed since it did not offer respondents the option to report using disposable specula. For those who use the disposable specula, disinfecting/sterilizing is not applicable since the instrument is

disposed of after use. Thus, the data from this question may not reflect the true protocols of these audiologists.

Regardless of some of the limitations of Amlani's (1999) scope of questions, the implementation of basic infection control procedures in the audiological environment was shown to be sub-par. Given the transition of the audiology toward the requirement of an entry-level doctorate for clinical practice, infection control becomes a much more important issue. As stated by Bankaitis (2005b), it the ethical, legal, and clinical responsibility for audiologists to consciously establish a health-care environment that is designed to minimize the potential for microbial transmission and/or cross contamination. These obligations are clearly outlined by OSHA and required by law. Furthermore, infection control has been recognized as a form of best clinical practice, endorsed by various Audiology organizations (Bankaitis, 2005b; Clark, Kemp, and Bankaitis, 2003). Despite outlined justifications and established needs for infection control, the extent to which infection control practices are implemented remains unknown. While Amlani's (1999) study provided initial insight into current practices, further follow-up with more specific questions addressing infection control standards is needed.

Purpose of present study

The purpose of this study is to assess current infection control trends in audiology. Specifically, knowledge obtained from this research will answer the following questions:

1. What is the extent to which Universal Precautions are applied in the clinical setting?
2. What percentages of respondents are familiar with general infection control nomenclature?
3. What future educational directives are reportedly needed and/or inferred from the data?

CHAPTER II

Methods

Subjects

Three hundred audiologists were solicited to participate in a 15-minute on-line survey made available through the website www.hostedsurvey.com addressing current infection control trends. Subjects were randomly selected from the most current Membership Directory of the American Academy of Audiology (AAA) by a third-party employed by AAA. Subjects with registered e-mail addresses were initially contacted via e-mail on December 5, 2006 and asked to participate in an on-line survey on infection control. Through the automated website, e-mail invitations have been sent to 300 subjects, outlining the purpose of the study, the importance of the subject's response, the usefulness of the data the profession of audiology, and an automatic link to the website. Responders were able to take the survey directly from the www.hostedsurvey.com website or they were able to click on a hyperlink within the personalized e-mail invitation. Appendix A contains a sample e-mail invitation letter.

To maximize response rates, two follow-up e-mails reminding participants of the study were sent. The first follow-up reminder was sent seven days following the initial December 5th invitation with the second and final follow-up reminder sent another seven days after the first follow-up reminder. Data was collected from December 5 through December 26.

On-Line Infection Control Questionnaire:

In the absence of a standardized infection control questionnaire, one was designed using Amlani's (1999) original questionnaire as a template, with responses sought on the following

four general areas: 1) extent of Universal Precautions in the clinical setting, 2) clinicians/students application of personal protective barriers, 3) general infection control nomenclature, and 4) future educational directives. Since the AAA membership is comprised of both licensed clinicians and students, the questionnaire was designed using a two-tiered format whereby practicing audiologists would be routed to answer specific questions pertaining to their primary work setting while currently enrolled students would be routed to answer identical questions that apply to their primary practicum setting. To clarify, while the questionnaire contains a total of 87 questions, each respondent will only have to answer approximately 40 questions. A hard copy of a non-formatted version of this study's questionnaire is located in Appendix B.

CHAPTER III

Results

Subjects:

The names of 300 subjects were randomly selected from the American Academy of Audiology (AAA) membership directory by a third-party representative of AAA and delivered to the author. The information provided by AAA was entered into the www.hostedsurvey.com distribution database. From the list of 300 randomly selected subjects, 290 (96.66%) had registered e-mail addresses and invitations to participate in the online survey were sent to the 290 subjects. Of those 290 subjects, 17 email invitations were returned as undeliverable (5.86%); therefore, a total of 273 subjects could be initially solicited to participate in the on-line survey.

Of the 273 distributed e-mail invitations, 76 subjects completed the online survey, resulting in an overall response rate of 27.84%. From this pool of subjects, five (5) of the surveys were incomplete and were not included in the analysis. The following represents results based on 71/273 (26.01%) completed surveys.

Data Analysis:

Survey responses were automatically tracked by the Hosted Survey websites' software program. The website's data program automatically tabulated responses in real time, as the data was collected. The data was stored in a secure database, accessible via password protection system. Once the data collection phase was closed, the information was downloaded from the website and analyzed.

Demographic Information:

Demographic data regarding gender, primary work setting, highest degree earned, number of years in practice, and the location of current work setting was collected. As shown in Figure 1, the majority of the respondents were female (59/71 or 83%) with a smaller percentage of male respondents (12/71 or 16.90%). Figure 2 shows that the terminal degree distribution was essentially equivocal for Master's (24/71 or 47.89%) and AuD (29/71 or 40.85%) degreed respondents while only a small percentage reported the PhD as the highest terminal degree (8/71 or 11.2%). Of those with Master's degrees, 32.35% (11/34) reported current enrollment in an AuD program.

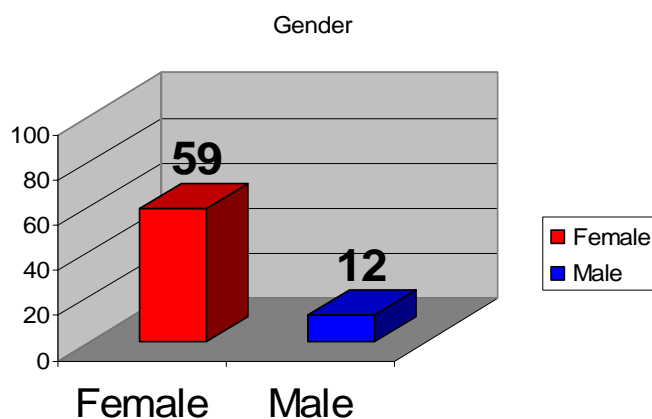


Figure 1: Number of respondents as a function of gender

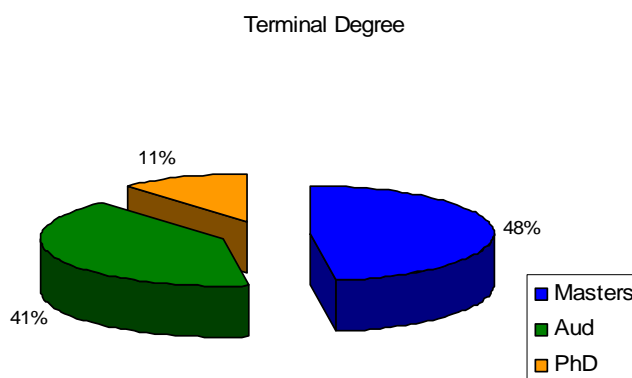


Figure 2: Percentage of subjects with corresponding terminal degrees

In terms of years in practice, Figure 3 illustrates that nearly half of the respondents (34/71 or 47.89%) reported more than 20 years of clinical experience, with nearly an additional quarter of respondents with 16 to 20 years of clinical experience (14/71 or 19.72%). The remaining subjects were essentially equally divided with about 14% in clinical practice for 1 to 5 years (10/71 or 14.08%), 7% (5/71 or 7.04%) with 6 to 10 years experience, and a little more than 11% (8/71 or 11.27%) reporting 11 to 15 years of experience. None of the respondents reported working for less than one year.

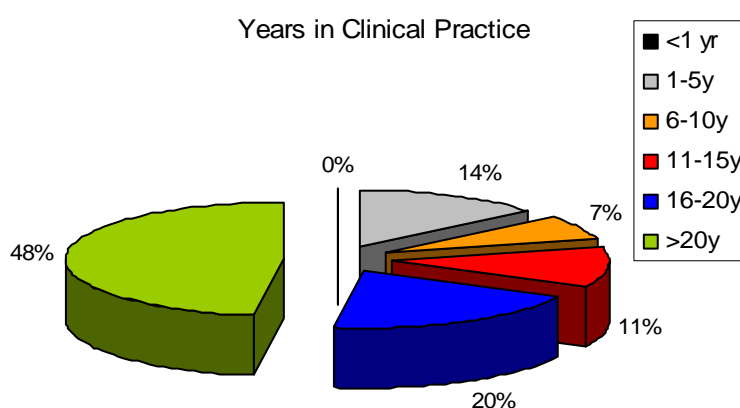


Figure 3: Number of respondents with corresponding years of professional experience

As illustrated in Figure 4, respondents reported employment in mainly one of three settings: private practice (21/71 or 29.58%), clinic/hospital setting (18/71 or 25.35%), or an ENT office (14/71 or 19.72%). Other work settings and corresponding distributions included public schools (7/71 or 9.86%), medical school/university (6/71 or 8.45%), VA/military/government settings (1/71 or 1.41%), manufacturer (2/71 or 2.82%), or other (2/71 or 2.82%).

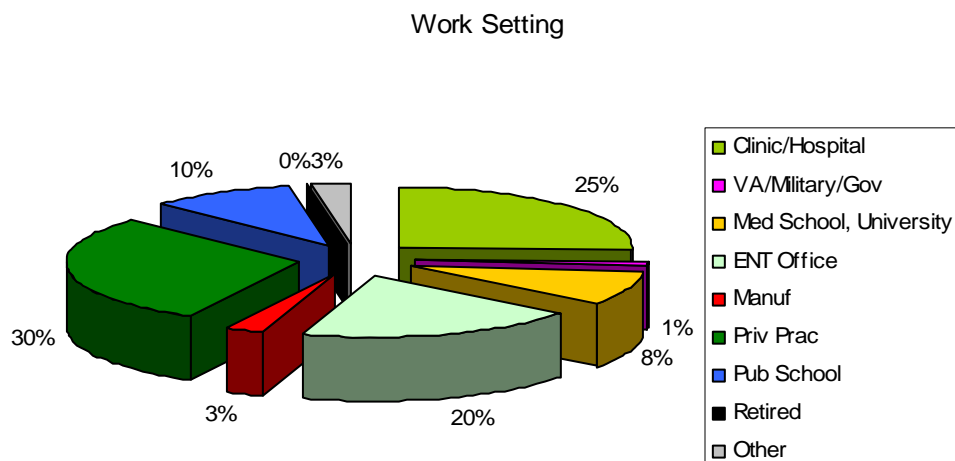


Figure 4: Percentage of respondents employed in different primary work settings

The distribution of the respondents working with the mainly adults with some pediatric patients and a fairly balanced adult and pediatric patient load was fairly equal with 33.80% (24/71) and 30.99% (22/71), respectively. A smaller percentage (11/71 or 15.49%) of respondents reported working with the pediatric only patient population. The remaining respondents reported working with adults only (6/71 or 8.45%) or mainly pediatric patients with some adult patients (5/71 or 7.04%). Four percent of the respondents (3/71 or 4.23%) reported not seeing patients at their primary work setting.

Table 1 outlines common audiological procedures and corresponding percentages of respondents involved in the provision of such services during a typical work week. Over 90% of respondents conducted otoscopy (64/71 or 90.14%), immittance audiometry (66/71 or 92.96%), and pure tone audiometry (65/71 or 91.55%) on a weekly basis. Approximately 70% conducted otoacoustic emissions (51/71 or 71.83%) as part of their diagnostic battery on a weekly basis. The remaining procedures were performed by a smaller percentage of respondents on a weekly

basis. For example, slightly less than one third of the respondents (22/71 or 30.99%) conducted evoked potential assessments whereas a quarter of the respondents (16/71 or 22.54%) administered electronystagmography (ENG) testing. A smaller percentage provided additional vestibular testing on a weekly basis beyond ENG (9/71 or 12.68%). Cerumen management was provided by more than a third of the respondents (25/71 or 35.21%). Nearly a quarter (13/71 or 18.31%) indicated involvement with central auditory processing (CAP) assessments. Finally, most of the respondents were actively involved in dispensing hearing instruments (54/71 or 76.06%) with a smaller percentage (8/27 or 11.27%) involved in fitting and programming cochlear implants.

Common Audiological Procedures	Percentage of Respondents
Otoscopy	90.14%
Pure tone audiometry	91.55%
Immittance audiometry	92.96%
Otoacoustic emissions	71.83%
Evoked potentials	30.99%
Electronystagmography (ENG)	22.54%
Other vestibular testing	12.68%
Hearing aid dispensing	76.06%
Cochlear Implants	11.27%
Central Auditory Processing	18.31%
Cerumen management	35.21%

Table 1: Common audiological procedures and corresponding percentages of respondents reportedly involved in the provision of such services during a typical work week

Extent to which Universal Precautions are applied:

As depicted in Figure 5, approximately half of the respondents (45.07% or 32/71) reported that the clinical setting was associated with high exposure rates to communicable disease; most of the remaining half (47.89% or 34/71) reported that the clinical setting was not associated with high rates to communicable disease. Only a small percentage of respondents (4/71 or 5.63%) answered “don’t know”. When respondents were asked if their clinical setting was associated with at least some risk of cross contamination, the percentage of respondents affirming potential risk increased to 73.24% (52/71).

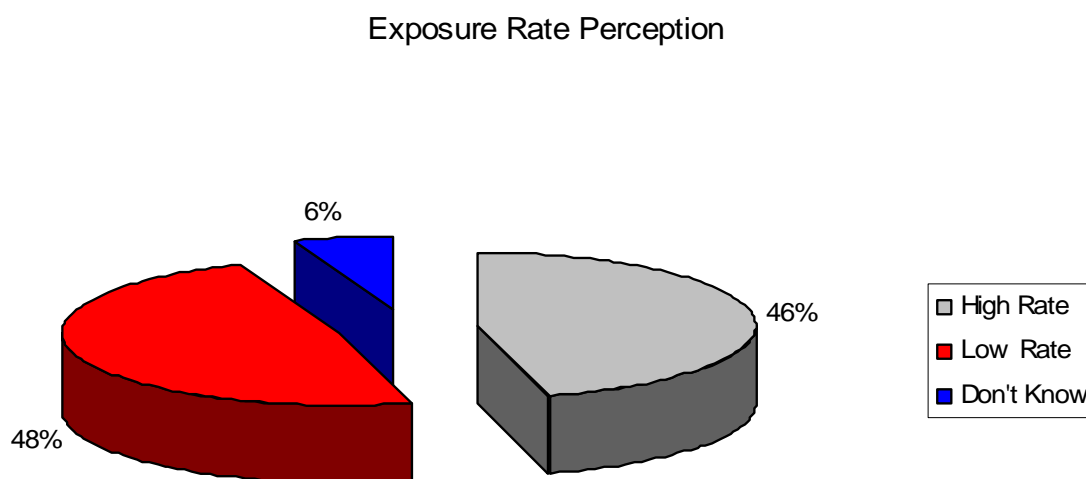


Figure 5: Perception of exposure rates to communicable diseases

Most respondents (58/71 or 81.69%) were aware of a written mandate regarding infection control (i.e., Universal Precautions) in their work setting. Nearly two-thirds (43/71 or 60.56%) indicated that audiology-specific infection control plans were maintained within their clinical setting. The remaining one third of the respondents indicated that audiology-specific infection control plans were either not available (22/71 or 30.99%) or did not know whether audiology-specific plans were maintained (5/71 or 7.04%).

In terms of employee classification, 30.99% (22/71) confirmed that classification status was provided at the time of initial hire although most, nearly half (35/71 or 49.30%), reported that employee classification designations were not provided. The remaining 15.49% (11/71) did not know the answer to this question.

Most respondents (52/71 or 73.24%) indicated that vaccinations were offered within their professional setting although 60.56% (43/71) reported that vaccinations were not mandated in their professional settings. Nearly half (35/71 or 49.30%) confirmed that vaccination and immunization records of all employees were kept on file whereas 33.80% (24/71) and 15.49% (11/71) indicated that records either were not kept or that record keeping policies were unknown, respectively. Almost half of the respondents (32/71 or 45.07%) reported that post-exposure records were documented. The other half of the respondents either indicated that post-exposure records were not documented (19/71 or 26.76%) or the status of such records was unknown (18/71 or 25.35%).

As shown in Figure 6, nearly 60% (42/71 or 59.14%) indicated that they received general infection control training prior to initiating clinical services at their primary work setting whereas 36.62% (26/71) did not. In contrast, as depicted in Figure 7, the majority of respondents, nearly two-thirds (45/71 or 63.38%), did not receive audiology-specific infection control training prior

to the provision of services. Only one third of the respondents (24/71 or 33.80%) reported training in this area. Approximately half reported that annual infection control training was conducted (36/71 or 50.50%). The remaining half either reported not receiving annual training (29/71 or 40.85%) or did not know (5/71 or 7.04%). In terms of annual training specific to audiology-related infection control measures, 76.06% (54/71) reported that this type of training was not provided; only a small percentage (13/71 or 18.31%) indicated that audiology related infection control training was provided. Most respondents worked at settings with and established plan on how to handle accidents, including steps to be taken when individuals have been exposed to bloodborne pathogens or other potentially infectious agents (60/71 or 84.51%). The remaining respondents either answered that their clinic had no such plan (6/71 or 8.45%) or that they did not know (4/71 or 5.63%).

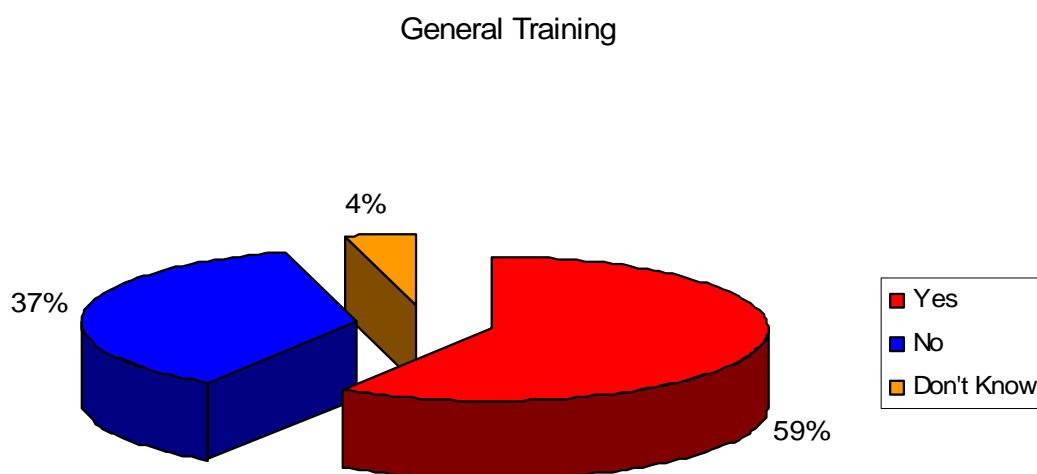


Figure 6: Percentage of respondents who received infection control training

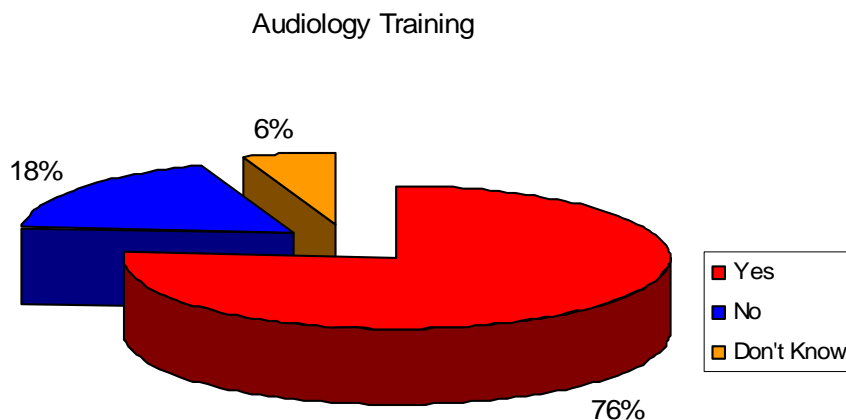


Figure 7: Percentage of correspondents who received audiology-specific infection control training

Hand Hygiene

Respondents answered questions regarding hand hygiene. Most reported having access to a sink with running water (68/71 or 95.77%) or to no-rinse hand degermers (65/71 or 91.55%). Figure 8 illustrates the percentage of respondents who reported performing hand-hygiene procedures following a variety of corresponding clinical procedures. The majority of respondents reported hand washing or the use of no-rinse degermers after use of the lavatory (62/71 or 87.32%), after each patient (58/71 or 81.69%), after earmold impression procedures (52/71 or 73.24%), after handling a patient's hearing aids with bare hands (52/71 or 73.24%), and pursuant to contact with bodily fluids (52/71 or 73.24%). In addition, nearly half conducted hand-hygiene procedures after cerumen removal (32/71 or 45.07%) or upon glove removal in general (31/71 or 43.66%).

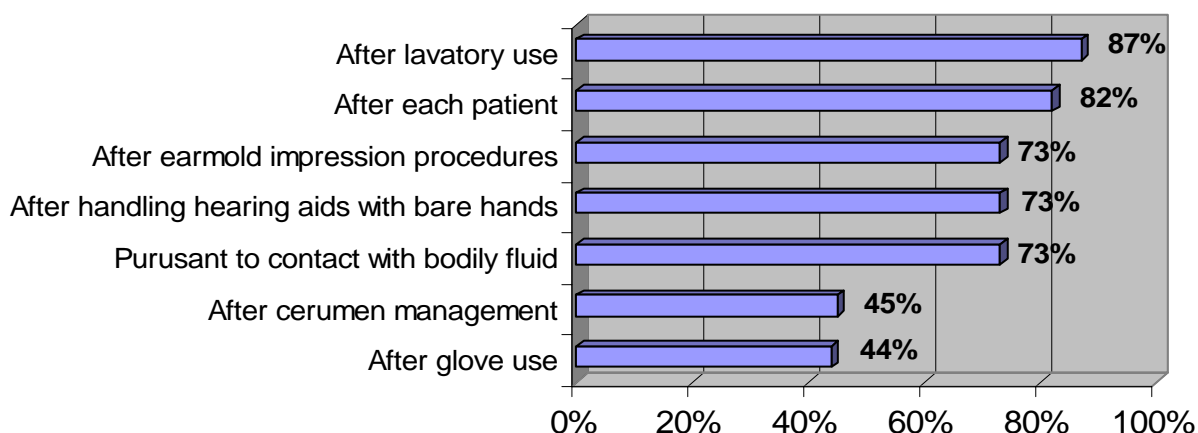


Figure 8: Percentage of respondents reportedly conducting hand-hygiene procedures for corresponding situations

Personal Protective Barriers

Most respondents (64/71 or 90.14%) had access to gloves in the work settings. As depicted in Figure 9, approximately one third reported wearing gloves across a variety of clinical procedures including during hearing instrument cleaning (28/71 or 39.44%) or disinfecting (26/71 or 36.62%) procedures, and when submerging or removing instruments into or from a cold sterilant (23/71 or 32.39%), when receiving and/or handling the patient's hearing instruments (25/71 or 35.21%), and during otoscopic procedures (22/71 or 30.99%) when the patient presented with visible ear drainage. A small percentage (4/71 or 5.63%) reportedly wore gloves all times during otoscopy. During cerumen management procedures, gloves were reportedly worn 18.31% (13/71) of the time. Only one respondent (1.41%) indicated wearing gloves during vestibular and balance assessments. None of the respondents (0%) used gloves

during evoked potential assessment. During earmold impression procedures, 5.63% (4/71) and 8.45% (6/71) wore gloves while injecting earmold impression material into the ear or during the earmold impression removal process, respectively. Nearly a quarter of the respondents (17/71 or 23.94%) reported not using gloves in any of the above clinical situations.

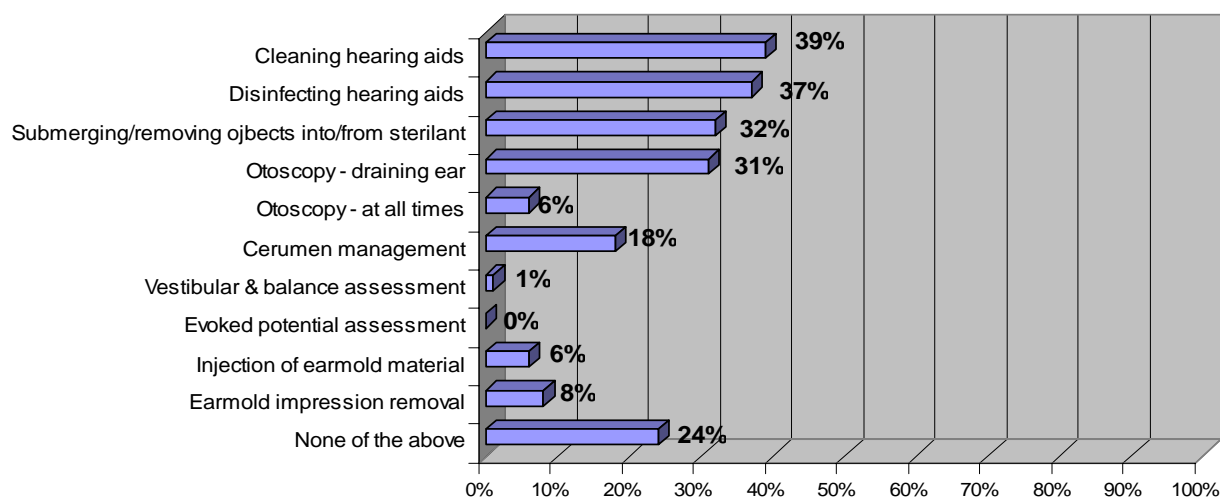


Figure 9: Number of respondents who wear gloves in the corresponding clinical situations

Slightly more than half (37/71 or 52.11%) indicated that eye protection was not used during the providing of clinical services although a quarter of the respondents (17/71 or 23.94%) relied on personal eyeglasses as eye protection. Over half of the respondents (41/71 or 57.75%) reported having access to masks with 39.44% (28/71) reported not having access to masks. For those who have access to masks, an overwhelming majority reported not using them during hearing aid/earmold modification procedures (63/71 or 88.73%).

Disposable versus reusable instrumentation

The majority of respondents reported the use of disposable otoscope specula (51/71 or 71.83%), disposable real-ear probe tubes (44/71 or 61.97%), and disposable insert earphones (59/71 or 83.09%). Less than half reported using headphone covers (34/71 or 47.89%). Disposable immittance and/or otoacoustic emission tips were used by slightly more than one third of the respondents (26/71 or 36.62%). In addition, a smaller percentage reported using disposable instruments for cerumen removal (10/71 or 14.08%).

The majority of respondents reported the use of non-disposable headphones (46/71 or 64.79%), immittance and/or otoacoustic emissions tips (44/71 or 61.97%), mechanical instruments used for cerumen removal (39/71 or 54.93%) and otoscope specula (27/71 or 38.03%). A smaller percentage of respondents indicated the use of non-disposable real-ear probe tubes (8/71 or 11.27%) and insert earphones (3/71 or 4.23%). Four respondents (5.63%) selected “none are applicable”, indicating that non-disposable instruments were not used in the clinical setting.

In terms of whether instruments/devices were are cleaned and/or disinfected after use and prior to reuse, the majority of respondents reported cleaning and then disinfecting immittance and/or otoacoustic emission tips (45/71 or 63.38%), mechanical instruments for cerumen removal (38/71 or 53.52%), otoscope specula (30/71 or 42.25%), and headphones (30/71 or 42.25%) after use and prior to reuse. Real-ear probe tubes (9/71 or 12.68%) and insert earphones (2/71 or 2.82%) were reportedly cleaned and disinfected less often. About 13% (9/71 or 12.68%) of the respondents indicated “none are applicable”, indicating that cleaning and disinfecting were not necessary procedures.

Respondents were also questioned about sterilization procedures and protocols. Based on the results obtained from this questionnaire, items were cleaned and then sterilized as follows: immittance and/or otoacoustic emission tips (36/71 or 50.70%), mechanical instruments used for cerumen removal (32/71 or 45.07%), otoscope specula (23/71 or 32.39%), and headphones (22/71 or 30.99%). Real-ear probe tubes (8/71 or 11.27%) and insert earphones (2/71 or 2.82%) were reportedly cleaned and then sterilized prior to re-use. Nearly a quarter of respondents (15/71 or 21.13%) selected “none are applicable”.

Touch and splash surfaces were reportedly cleaned and disinfected after each patient 15.49% of the time (11/71) while 16.90% (12/71) and 7.04% (5/71) disinfected these surfaces either once a day or once a week, respectively. One respondent (1.41%) reported that such surfaces were never disinfected. Over half of the respondents (39/71 or 54.93%) reported reliance on professional discretion as to whether such surfaces needed to be cleaned and disinfected.

Over one-third (28/71 or 39.44%) of the respondents reported reliance on professional discretion as to whether or not motivational toys used during assessment procedures had to be cleaned and then disinfected. Slightly less than one-third (20/71 or 28.17%) disinfected objects after each patient appointment whereas 7.04% (5/71) conducted procedures once a day, either at the beginning or end of the day. One respondent (1.41%) reported disinfecting such objects once month with one other respondent (1.41%) reporting that motivational toys were never disinfected. With regard to waiting room toys, over half the respondents (41/71 or 57.75%) indicated that this question was not applicable. The remaining 8.45% (6/71) and 4.23% (3/71) of the respondents reported cleaning and disinfecting waiting room toys either once a month or once a week, respectively.

Terminology

With regard to terminology, three quarters of the respondents (53/71 or 74.65%) correctly identified the definition for the term cleaning; the remaining quarter erroneously identified the term “cleaning” using the definition “disinfection” (12/71 or 16.9%) or sterilization (3/71 or 4.23%). One respondent (1.41%) erroneously indicated none of the above. When provided with the definition for the term “disinfection”, three quarters of the respondents (54/71 or 76.06%) correctly identified the term; the remaining respondents erroneously identified the term “disinfection” using the definition of the term “cleaning” (8/71 or 11.27%) or sterilizing (7/71 or 9.86%). Finally, when provided with the definition of sterilization, most of the respondents correctly identified the term (60/71 or 84.51%); the remaining respondents erroneously identified the term “sterilizing” using the definition of “disinfection” (9/71 or 12.68%) or left the question unanswered (2/71 or 2.82%).

Need for Further Education

Three quarters of the respondents (54/71 or 76.06%) attended at least one educational workshop or lecture specifically addressing infection control in the audiology clinic sometime throughout their professional career, with a quarter of this group (18/71 or 25.35%) attending a course in the past year. A much smaller percentage (15/71 or 21.13%) did not attend a course during their professional career. Two of the respondents left this question unanswered. For those respondents who attended at least one educational presentation, 71.83% (51/71) indicated that the educational information received in these types of presentations influenced their infection control procedures whereas only 2.82% reported that the education did not influence clinical practice. Finally, 43.66% (31/71) reported that infection control education should be a mandatory

prerequisite for state licensure and national certification whereas 30.99% (22/71) felt that this is not necessary. Nearly a quarter (17/71 or 23.94%) was not sure as to whether or not infection control should be required for licensure and certification.

CHAPTER IV

DISCUSSION AND CONCLUSIONS

The purpose of this study was to gain insight toward current infection control trends in audiology. To achieve this goal, a randomly selected list of 300 names was generated by AAA from its membership listing of nearly 10,000 members. Since the study involved an on-line questionnaire, only those members with registered e-mail accounts with AAA could be contacted. Not all of the subjects randomly selected from the AAA membership list had registered e-mail addresses with the Academy. This initially reduced the potential subject sampling from 300 to 290. Following delivery of the initial e-mail invitation to participate in the on-line survey, an additional 17 e-mails were returned as undeliverable further reducing the subject sampling to 273.

Overall, 76 subjects accessed the on-line survey for an overall response rate of 27.84%. Of these responses, 5 subjects only completed a portion of the demographic data, leaving the remainder of the questionnaire blank. As a result, these 5 questionnaires were not included in the data analysis. Taking into the consideration the 71 responses analyzed, the results of this study are based on a return rate of 26.02% (71/273).

In an effort to maximize subject participation, two follow-up reminders were e-mailed to subjects after the initial invitation was sent on December 5, 2006. The first reminder was issued on December 12, 2006 while the second and final follow-up reminder was issued on December 19. The on-line questionnaire was open to subjects through December 26, 2006. When the original invitation was sent on December 5, the number of subjects that responded prior to the issuance of the first follow-up reminder was 39 (14.2%). Upon delivery of the first follow-up

reminder, 19 additional subjects completed the survey (21.12%). Following the second and final follow-up reminder sent out on December 19, an additional 13 subjects responded to the survey (26.02%).

The systematic follow-up design assisted in increasing the overall response rate by 10%. It is possible that additional responses may have been obtained if the data collection period occurred a month later. The data collected for this study occurred in December, 2006, at a time when subjects may have been in the office a limited amount of time due to the holiday season. It is possible that initiating data collection during the month of January may have yielded a higher response rate. Nevertheless, the obtained response rate (26%) remains respectable and sufficient to draw general conclusions about current infection control trends.

Overall, more females responded to the on-line survey than males. Taking into consideration the gender distribution within the audiology profession, a higher female response rate was expected. Terminal degree for the subjects was essentially equivocal with approximately half of the respondents with a Master's degree and the other half with the AuD degree. A very small percentage of subjects (10.53%) reported the PhD as the terminal degree. This overall distribution was consistent with general trends reflected in the AAA membership distribution. The absence of full-time students within the randomly selected subject pool was surprising. Since AAA offers student memberships, it was anticipated that at least a few full-time audiology students would be selected in the random sampling. Approximately one-third of the respondents did indicate student status however these subjects were full-time audiologists enrolled in part-time AuD programs. Since the employment status of these subjects met the definition of full-time audiologist, subjects enrolled in part-time AuD programs were not considered students and classified as practitioners for purposes of this study.

In terms of employment setting, most of the respondents in this study were either employed in private practice, a clinic/hospital, or ENT office. While the majority reported employment in private practice, pooling different employment settings into more general categories revealed an affinity toward employment in medical settings. For example, more than half were collectively employed in a hospital, medical center, VA, or ENT facility. The fact that most subjects were employed in medical settings may potentially bias infection control trend data as medical settings may be more familiar with and more likely to enforce infection control standards set forth by OSHA as these standards are requirements for accrediting healthcare bodies such as the Joint Commission for the Accreditation of Healthcare Organizations (JCAHO). Many healthcare organizations seek JCAHO accreditation as it assists centers in improving in quality care, enhances community confidence and medical staff recruitment, expedites third-party payment eligibility, and favorably influences liability insurance premiums (JCAHO, 1998). Since part of JCAHO surveys involve infection control standards, it is possible that audiologists employed in medical settings seeking such accreditation may be more familiar with infection control standards as compared to their private-practice counterparts. Although this study was not designed to compare trends in these two distinct groups, infection control questionnaires specifically directed at private practice clinicians may generate very different infection control implementation trends than those questionnaires directed specifically at audiologists employed in accredited hospitals.

Application of Universal Precautions in the Clinical Setting

General infection control mindset:

The extent to which Universal Precautions are applied in the clinical setting was determined by posing questions pertaining to general mindsets regarding infection control as well as questions addressing adherence to outlined written infection control plan requirements. Of the 71 surveys analyzed, nearly half (46%) reported that the clinical setting is associated with a high exposure rate to communicable disease. Compared to Amlani's (1999) infection control study, these findings were encouraging since only 20% of the respondents from Amlani's study indicated that the audiology clinic was associated with high exposure to communicable disease. Various factors may have contributed to this increased awareness including the discovery of HIV/AIDS and subsequent focus allocation on infection control, the expanded scope of audiological practice which has occurred over the past 20 years, an increase in infection control literature addressing application to audiology, and access to audiology-specific infection control presentations and seminars. For purposes of this study, these extrinsic variables could not be controlled for as they are representative of the evolvement of the audiology profession.

In the absence of controlling for such extrinsic variables, one of the strengths of this study was the integration of more specific questions designed to gain additional insight into subjects' perceptions regarding the risk of communicable disease in the clinical setting. For example, the infection control questionnaire designed for this study not only asked participants the question "...does your professional setting have a high exposure to communicable disease?", but it also posed the second follow up question "...is your professional setting associated with at least some risk to cross contamination that could potentially lead to localized infection or disease?". In this particular study, less than half of the respondents (46%) initially indicated that

the clinical setting was associated with a high risk of exposure to disease. However, by posing a second, more specific follow up question, an overwhelming majority (73%) answered that the audiology clinic was associated with at least some risk of communicable disease. While Amlani (1999) also posed the question "...does your professional setting have a high exposure to communicable disease?", the study was limited in that it only asked respondents whether or not the clinical setting was associated with a *high risk* of exposure to communicable disease. It is possible that some of the subjects from the Amlani (1999) study who answered "No" may have done so because they felt that the exposure risk was low or medium. The wording of Amlani's question may have caused subjects to respond with an answer that was not necessarily representative of opinions regarding disease transmission risk factors in the clinical environment.

Despite the apparent improvement from what Amlani found, the current perceptions regarding associated risk for the spread of disease in the clinical environment remain concerning the mindset of Universal Precautions requires clinicians to assume that every patient is a potential carrier of an infectious disease (CDC, 2002). When this mindset is recognized and accepted, clinicians who are posed with the question, "Is the clinical environment associated with a high exposure to communicable disease?", the answer should be an overwhelming "Yes". Over the past decade, a significant amount of infection control literature and its applications to audiology has been published, specifically addressing the need for infection control in the clinical setting (Bankaitis and Kemp, 2003a, 2003b; Bankaitis 2002; Sturgelewski et al, 2006) . The audiology clinic is associated with a relatively high risk of disease transmission. Nevertheless, a relatively large percentage of clinicians do not perceive the audiology clinic as an environment associated with a high risk of cross-contamination.

While this study did not address this issue, it would have been beneficial to ask respondents to provide information as to why they felt that the audiology clinic was not associated with the potential spread of disease. The author felt that it is possible that more veteran clinicians who were trained prior to the various extrinsic variable milestones (i.e. discovery of HIV/AIDS, scope of practice expansion, etc.) may have been less inclined to categorize the audiology clinic as an environment associated with high risk of disease transmission. In an attempt to gain some insight into this issue, the data collected for this study was further segregated, categorizing respondents into subgroups as a function of years in clinical practice. When analyzing the data across sub-groups, the result for each group was equivocal. For example, of the 34 respondents with more than 20 years of clinical practice, 50% of this group (17/34) indicated that the audiology clinic was associated with a high risk of disease transmission whereas 47% (16/34) indicated that the audiology clinic was not associated with a high risk of disease exposure. One respondent from this group responded with “don’t know”. This trend was evident across the remaining groups. It remains unclear as to why practicing clinicians dismiss the potential of disease transmission in the audiology clinic. Future studies exploring these issues would be beneficial.

Written infection control plan requirements:

As outlined in earlier chapters, OSHA requires facilities to have a written infection control plan. Over 80% of respondents indicated that a written infection control mandate was in place at the employment setting. This is a nearly 30% increase as compared to Amlani’s (1999) report of 51%. Written infection control mandates are comprised of six required elements as follows: 1) employee exposure classification, 2) HBV vaccination plan and records, 3) plan for

annual training, 4) plan for accidents, 5) implementation protocols, and 6) post exposure plans.

The questionnaire designed for this study posed questions addressing each of the six requirements outlined by OSHA.

Employee Exposure Classification

Nearly half the respondents (49.30%) indicated that employee exposure classifications were not designated at the time of hiring. OSHA requires for each employee to be classified on the basis of potential exposure to blood and other infectious substances (Bankaitis and Kemp, 2003a, 2003b). Classification assists with implementation of necessary infection control procedures and training. It is possible that all employees were classified but only half of the respondents recalled their level of classification. The results of this question may not necessarily reflect adherence to infection control standards; rather, it may be a reflection of information recall on the part of the subjects. Amlani's (1999) study did address employee classification.

HBV Vaccination Plan and Records

According to OSHA, employers are required, by law, to offer all employees with Category 1 or Category 2 exposure classifications HBV vaccinations. Most respondents were offered HBV classifications, as expected. Surprisingly, 60.56% indicated that HBV vaccinations were not mandated, suggesting that the employer did not require HBV vaccinations. By law, employees are not required to accept the vaccination; in these instances, a waiver must be signed by the employee and filed (Bankaitis and Kemp, 2003a, 2003b). Furthermore, any audiologist involved in the provision of clinical services meets the Employee Exposure Classification Category of either 1 or 2; therefore employers are required to offer audiologists HBV

vaccinations. Whether or not the employee proceeds with the vaccination is dictated by the employee, not the employer.

Plan for Annual Training

Approximately one half of respondents indicated receiving infection control training prior to employment and only one-third received infection control training specific to audiology procedures. Interestingly, only half of the respondents (50.5%) reported a plan for annual infection control training, a lower percentage than the 69% reported by Amlani (1999). Furthermore, less than 20% received audiology-specific infection control training on an annual basis. This decrease is not surprising given the smaller percentage that received audiology-related infection control training in the first place.

Plan for Accidents

Only one question was posed as to whether or not the employment setting had a plan on how to handle accidents. Most respondents confirmed the existence of a plan for accidents; however, the confirmation of a plan does not guarantee that the clinic is actually prepared to execute accident plans efficiently or effectively. The level of preparedness was not further explored by Amlani.

Implementation Protocols

As indicated in the section on Plan for Annual Training, most subjects did not receive infection control training specific to audiology procedures. This is an often overlooked requirement as many clinicians assume that the general five points outlined in the Universal

Precautions is sufficient to meet the requirements of a written infection control plan.

Implementation protocols include work practice controls, which are profession-specific protocols that outline how to deliver services with the goal of minimizing the potential for disease transmission (Bankaitis and Kemp, 2003a, 2003b). In other words, audiology clinics are required to have their own set of protocols on how audiology-specific procedures will be executed. Since less than 20% of the respondents in this study indicated that audiology-specific infection control training was provided on an annual basis, it is highly unlikely that a higher percentage of respondents have access to written implementation protocols. Surprisingly, nearly two-thirds (60.56%) reported that audiology-specific infection control plans were maintained in the employment setting. Having access to written infection control protocols is critical; however, training ensures that the actual protocols are executed. Again, although most of the respondents indicated that implementation protocols were available, the extent to which these protocols are properly executed remains unknown.

Post Exposure Plans

Less than half of the respondents could confirm that post-exposure records were documented and maintained on record. These types of plans are for those instances when a medically treatable exposure occurs (e.g. a needle stick from a patient who may have HBV). With the exception of those involved in intraoperative monitoring, most audiologists do not find themselves in a position where they may accidentally stick themselves with a contaminated needle. From that perspective, the fact that less than half of the respondents indicated post-exposure records were properly maintained does not necessarily indicate lack of compliance on the part of the employer.

Adherence to Universal Precautions:

In an effort to determine the extent to which Universal Precautions were integrated into clinical practice, the questionnaire used for this study was designed to specifically pose questions regarding hand hygiene practices, the use of appropriate barriers such as gloves and masks, cleaning and disinfecting protocols, and sterilization procedures.

Hand Hygiene

While most of the respondents had access to a sink with running water (95.77%) or to no-rinse hand degermers (91.55% or 65/71), accessibility did not correspond to consistent application of hand hygiene procedures. For example, most of the respondents (87%) washed their hands or used no-rinse hand degermers after using the lavatory. This reflects a slight increase from the 50% of respondents reported by Amlani (1999). Similarly, hand hygiene procedures were implemented after each patient appointment, following cerumen management procedures, and after taking earmold impressions. Despite the reported increase in hand hygiene procedures, surprisingly, hand hygiene measures pursuant to contact with bodily fluids decreased from the reported 100% found by Amlani (1999) to 73.24% (52/71) of respondents in this study. It would seem that an overall increase in hand hygiene as reported in this study would most likely result in consistent hand hygiene procedures following contact with bodily fluids. Unfortunately, this trend was not evident in this study. It is possible that many audiologists consider cerumen an incidental substance rather than a potentially infectious bodily substance.

Personal Protective Measures

Compared to the initial findings reported by Amlani (1999), the use of gloves did increase based on the results of this study. While gloves use occurred more often, this study showed that there remain instances when gloves are not used when they should be. For example, a very small percentage of subjects reported using gloves when removing earmold impressions from patients' ear canals. The entire surface of the portion of the earmold impressions removed from the ear canal is contaminated with cerumen and other microorganisms that may be residing in that particular ear canal. Despite the potential of cross-contamination occurring when handling earmold impressions with bare hands, less than 9% of the subjects used gloves during these procedures. Furthermore, approximately one-third of the subjects reported wearing gloves and handling hearing instruments that have not been first cleaned and then disinfected. Previous studies have clearly shown that hearing instruments are contaminated with a variety of microorganisms that are not necessarily part of the ear canal flora (Bankaitis, 2002; Sturgulewski et al, 2006). Furthermore, if hearing instruments are being handled with bare hands, it is possible that the instruments are being further contaminated as a result of coming in direct contact with the audiologist's hands, especially if that particular audiologist does not consistently practice necessary hand hygiene procedures. This in combination with those audiologists who are not utilizing proper hand hygiene procedures can increase the possibility of cross-contamination and spread disease.

In terms of access to other protective barriers, more than half did not have access to masks. While masks may not be required that often, this question was specifically posed to determine if audiologists employ the use of masks during hearing aid and earmold modification procedures. This was of particular interest for several reasons. First, hearing aid and earmold

modification procedures involve the use of a grinding and/or buffing wheel. Since these equipment parts reside in the clinical environment, over time, they become contaminated with ubiquitous organisms. It is extremely difficult to keep the wheels void of microbial contamination. Secondly, the wheels are susceptible to further contamination when audiologists refrain from cleaning and disinfecting the hearing instrument or earmold prior to using the wheel. Any microbial growth on these surfaces will be transferred to the wheel. Thirdly, during the actual modification procedures, the buffing action of the wheel generates a lot of particles in the air. Although this type of instrument is typically equipped with a shield, the shield does not provide enough protection to eliminate the potential of breathing in dust created during these procedures. Despite the high level of cross contamination that can occur during hearing aid or earmold modification procedures, as reported by Amlani (1999), most respondents in this study (63/71 or 88.73%) did not use masks in this instance.

Touch and Splash Surfaces

According to infection control standards, touch surfaces such as countertops and armchair rests, as well as any surface that a patient can cough or sneeze upon, should be cleaned and disinfected immediately following the conclusion of the provision of clinical services. Over half of the respondents (39/71 or 54.93%) reported disinfecting touch surfaces; however, the actual procedure was reportedly based upon the discretion of the clinician. While clinicians may occasionally need to rely on their discretion to determine if something should be disinfected versus sterilized, cleaning and disinfecting these surfaces is a requirement and not an optional procedure to be determined by the clinician.

Familiarization with Infection Control Nomenclature:

This study attempted to assess current understanding of basic infection control nomenclature since infection control requirements involve the appropriate application of cleaning, disinfecting, and sterilizing. Knowing when and how to do each of these three techniques will influence the effectiveness of an infection control program. For this particular study, approximately 75% of respondents correctly identified the definition of the term “cleaning” and the definition of the term “disinfecting”. In addition, nearly 85% of the respondents correctly identified the definition of the term “sterilization”. Compared to Amlani's (1999) findings, there was not what could be considered a significant difference in overall terminology recognition. Essentially the same percentage of respondents correctly identified the definition of cleaning and sterilization in this study as compared to that of Amlani's study (1999). The only noticeable difference was Amlani found that only 55% of respondent could correctly identify the term “disinfecting” whereas this study revealed a higher percentage of subjects responding correctly.

These questions are important to ask as they directly influence infection control trends. If a clinician is not familiar with infection control terms, the effectiveness of infection control procedures will be compromised. For example, instruments that are intended to be reused between patients that become contaminated with cerumen must first be cleaned and then sterilized. By definition, instruments that come in contact with cerumen are considered critical instruments and the OSHA infection control guidelines are very clear in terms of how these instruments need to be handled prior to reuse. If a clinician cleans and then only disinfects this type of instrument, the instrument may still be contaminated.

Disposable and Reusable Instrumentation:

This study not only inquired as to knowledge regarding terminology of infection control terms, but posed questions that shed insight as to whether or not infection control theory was being correctly applied in clinical practice. One of the weaknesses of Amlani's (1999) study is that information was not gathered regarding whether or not subjects used disposable instruments. Differentiation of disposable versus non-disposable objects or items is critical since those using disposable instruments may answer questions regarding disinfection or sterilization correctly, but inadvertently create the impression that appropriate techniques are not being applied. For example, consider the clinician who typically uses a disposal curette to remove cerumen. When posed with the question "Do you sterilize curettes after removing cerumen?", the clinician would most likely answer "No" since they will dispose of the instrument after use and never use it again. Unfortunately, the wording of the question does not provide the clinician with the opportunity to clarify that the reason the answer was "No" is because disposable instruments are used.

To further address this point, consider the finding that only 42% of respondents reported cleaning and then disinfecting otoscope specula after use. In isolation, the finding may generate a conclusion that the subjects in this study did a poor job in applying infection control techniques. However, a large percentage of subjects also reported using disposable specula. It is logical to conclude that the reasons a lower number of subjects reported cleaning and disinfecting otoscope specula is because many of the same subjects reported the use of disposable specula. Presumably, disposable specula are thrown away after use and do not undergo typical cleaning and disinfecting procedures.

On the contrary, a large portion of respondents used reusable instruments including immittance probe tips and mechanical instruments for cerumen removal. Since these instruments were specifically identified by respondents as reusable, the findings pertaining to whether or not these instruments were cleaned and then either disinfected or sterilized becomes a more important issue. On average, a little more than 60% reported cleaning and then disinfecting immittance probe tips whereas another 50% reported cleaning and then sterilizing immittance probe tips. Based on these results, it appears that a small percentage of subjects not only clean and disinfect immittance probe tips, but then in turn sterilize the tips as well. Although items do not need to be disinfected prior to sterilization, the fact that subjects are reportedly cleaning and then either disinfecting or sterilizing immittance probe tips is encouraging.

With regard to cerumen management instruments, the finding that only 45% of the respondents properly cleaned and then sterilized instruments prior to reuse was discouraging. As previously reported, OSHA requirements regarding critical instruments, including reusable cerumen management instruments, is very clean. Without exception, these instruments must be cleaned and then sterilized prior to reuse. More than half of the respondents reported that these types of instruments were disinfected. Unfortunately, disinfecting a critical instrument that comes in direct contact with cerumen or one which can accidentally penetrate the ear canal skin, does not meet infection control standards.

Motivational versus Waiting Room Toys:

Nearly 40% of respondents reported disinfecting both motivation and waiting room toys as dictated by the discretion of the clinician. Unfortunately, most clinicians do not recognize the difference between what is considered a motivation toy versus a waiting room toy. A motivation

toy refers to a toy or other object specifically used by the clinician during audiometric assessment or the provision of rehabilitative services (Bankaitis and Kemp 2003a, 2003b). It is an object that resides within the clinical setting and therefore must be cleaned and disinfected prior to reuse with other patients. In contrast, a waiting room toy refers to a toy or object that resides in the reception area, outside of the confines of the clinical setting (Bankaitis and Kemp, 2003a, 2003b). While it is important to clean and disinfect waiting room toys daily, since these items technically reside outside of the clinical setting, they do not need to meet the same requirements as a motivational toy. As previously stated, infection control standard outlining when to clean, disinfect, and/or sterilize are straightforward. Reusable objects, including motivation toys used during assessments or rehabilitation, must be cleaned and disinfected after each appointment. Professional discretion does not play a part as to whether or not these procedures need to be followed.

Need for Further Education:

The majority of respondents (54/71 or 76.06%) have attended an educational workshops or short courses, on infection control practices directly related to the audiology clinic with a quarter of the attendees indicating that participating occurred in the past year. Based on the results of this study, the percentage of respondents who have attended an infection control workshop doubled compared to the 38% attendance rate reported by Amlani (1999). A large portion of respondents' (51.71 or 71.83%) clinical practices were influenced by the educational experiences. In assessing the data collected in this study, it would appear that a higher percentage of subjects are implementing infection control procedures into their clinical practice

as compared to what Amlani reported. For example, there evidence of increases in hand hygiene and overall glove use in this study in comparison to the Amlani study.

When asked if continuing education for infection control should be a mandatory prerequisite to state licensure and national certification, 43.99% of respondents (31/71) agreed that it should be a prerequisite. There may be reluctance in endorsing infection control as a contingency of licensure or national certification as it perceptually creates a burden of additional responsibilities on the part of the clinician. On the contrary, considering that infection control is a federal mandate, requiring coursework to secure or maintain licensure may be effective in facilitating the implementation of necessary procedures.

Conclusions

The purpose of this study was to assess the current infection control trends in audiology. This study investigated the extent to which Universal Precautions are applied in the clinical settings, the percentages of respondents familiar with general infection control nomenclature, and the future educational directives. The general awareness of Universal Precautions and proper infection control guidelines has increased since the Amlani (1999) study was published. This could be due to increases in the percentages of respondents that are receiving general infection control training prior to the provision of clinical services. Clinical practices involving the institution of the Universal Precautions are being utilized, but not to the degree that they should be. Practicing audiologists are taking steps toward compliance of government standards; however, there is a degree of apathy for complete compliance. This could be due to the lack of audiology-specific training sessions, annual re-training sessions, and the overall reluctance for infection control education to be part of licensure and certification.

Given the transition of the audiology toward the requirement of an entry-level doctorate for clinical practice, infection control becomes a much more important issue. As stated by Bankaitis (2005b), it is the ethical, legal, and clinical responsibility for audiologists to consciously establish a health-care environment that is designed to minimize the potential for microbial transmission and/or cross contamination. These obligations are clearly outlined by OSHA and required by law. Furthermore, infection control has been recognized as a form of best clinical practice, endorsed by various Audiology organizations (Bankaitis, 2005b; Clark, Kemp, and Bankaitis, 2003). Despite outlined justifications and established needs for infection control, infection control practices are still not being implemented in the extent that is truly needed in order to protect not only the patients that are seen by audiologists, but also the audiologists themselves.

Future research

Future research directives include pursuing this same questionnaire to an expanded audience. This study was sent to a list of AAA members with registered email addresses. A larger pool of respondents could be reached if the study was distributed via traditional mail. Additionally, the questionnaire could be sent to students within the AAA directory to address if there is a difference in infection control practices of those still within the university practicum settings versus those who are practicing audiologists. Further research could compare infection control practices of those practicing audiologists who are employed in the medical settings compared to those who are in the private/business sector. It would be intuitive that those who are employed in medical settings would have more stringent infection control practices than those employed in private settings.

References

- Amlani, AM (1999). Current trends and future needs for practices in audiologic infection control. *Journal of the American Academy of Audiology*. 10:151-159.
- Bankaitis, AU (2005a). Hearing aids: lick ‘em and stick ‘em? Sticking hearing aids in the mouth is not a good idea. *Audiology Today*. 17(6): 2-3.
- Bankaitis, AU (2005b). Infection control in the audiology clinic: frequently asked questions. *Audiology Today*. 17(5): 17-19.
- Bankaitis, AU (2002). What’s growing on your patient’s hearing aids? A study gives you an idea. *Hearing Journal*. 55(6): 48-53.
- Bankaitis, AU & Kemp, RJ (2003a). *Infection control in the audiology clinic*. Boulder, CO: Auban.
- Bankaitis, AU & Kemp, RJ (2003b). *Infection control in the hearing aid clinic*. Boulder, CO: Auban.
- CDC (2002). Guideline for hand hygiene in health-care settings. *MMWR*, 51 (RR16): 1-44.
- CDC (1987). Recommendations for prevention of HIV transmission in health-care settings. *MMWR*, 36 (2S).
- Clark , JG Kemp, RJ & Bankaitis, AU (2003). Infection control in audiology practice. American Academy of Audiology Guideline. *Audiology Today* , 15(5): 12-19.
- Kemp, RJ & Bankaitis, AE (2000). Infection control for audiologists. In: H. Dunn, R. Roeser and M. Valente (Ed) *Handbook of Audiology* (pp. 257-272). New York, New York: Thieme Publishing.
- Sturgulewski SK, Bankaitis AU, Klodd DA, & Haberkamp T (2006). What’s still growing on your patient’s hearing aids? *Hearing Journal*. 59(9): 45-48.

Appendix A

Dear AAA Member:

This survey is being randomly distributed to a portion of the AAA membership to help determine current infection control trends in the audiologic clinic. This survey takes approximately 15 minutes to complete. Your answers are very important as they will help provide a more accurate reflection of current infection control practices implemented by both audiologists and audiology students.

Below is a link to the online survey. Your response will be kept completely confidential. The survey is web-based and conducted by a third party vendor. Your name will not be attached to any of the results. The survey is user-friendly and you should be able to complete it in 15 minutes or less.

We appreciate your willingness to participate and value your feedback. Completing this survey will assist an AuD Capstone Project currently in progress at the Central Institute for the Deaf at Washington University School of Medicine.

If you have any questions, please contact Alison Burco at burcoa@msnotes.wustl.edu.

To begin, please click the survey URL below:

Survey URL: <http://www.hostedsurvey.com/takesurvey.asp?c=Curren163229&rc=1>

Thank you again for your participation,

Alison Burco

AuD Student

Central Institute for the Deaf at Washington University in St. Louis, School of Medicine
St. Louis, MO

Appendix B

GENERAL INFORMATION:

1. Gender: M F
2. What is the highest terminal degree you have earned?
 - a. Audiology Student (skip to question 11)
 - b. Master's Degree
 - c. AuD
 - d. PhD
 - e. Other (please specify) _____

IF YOUR ANSWER TO QUESTION 2 WAS a-AUDIOLOGY STUDENT, SKIP QUESTIONS 3-10 AND PROCEED TO QUESTION 11

3. What year was your terminal degree conferred? _____
4. Are you currently a student actively enrolled in an AuD program? YES NO

If you answered YES to question 4 and you are actively enrolled in an AuD Program, what is your expected graduation date from the AuD program?

5. How long have you been a practicing audiologist?
 - a. Less than 1 year
 - b. 1 to 5 years
 - c. 6 to 10 years
 - d. 11 to 15 years
 - e. 16 to 20 years
 - f. More than 20 years
6. What is your current primary work setting?
 - a. Clinic/Hospital
 - b. VA/Military/Government
 - c. Medical School, University
 - d. ENT office
 - e. Manufacturer
 - f. Private Practice
 - g. Public School
 - h. Retired
 - i. Other (please specify): _____

7. Number of years at current primary work setting?
 - a. Less than a year
 - b. 1 to 5 years
 - c. 6 to 10 years
 - d. 11 to 15 years
 - e. 16-20 years
 - f. More than 20

8. What state is your primary work setting located in? _____

9. What patient population do you currently serve at your primary work setting?
 - a. Adults only
 - b. Mainly adults (80% or more) with some pediatric patients (up to 20%)
 - c. Fairly balanced representation of adults and pediatric patients
 - d. Mainly pediatric patients (80% or more) with some adult patients (up to 20%)
 - e. Pediatric only
 - f. Don't see patients

10. In a typical week, what services do you personally provide (Circle all that apply)
 - a. Pure tone audiometry
 - b. Immittance audiometry
 - c. Otoscopy
 - d. Otoacoustic emissions
 - e. Evoked potentials
 - f. ENG
 - g. Other vestibular testing
 - h. Hearing aid dispensing
 - i. Cochlear implants
 - j. Central auditory processing
 - k. Cerumen management

IF YOU ANSWERED QUESTIONS 3-10, SKIP QUESTIONS 11-15 AND PROCEED TO QUESTION 16

IF YOU ARE NOT CURRENTLY A PRACTICING AUDIOLOGISTS OR HAVE NEVER PRACTICED AUDIOLOGY, PLEASE ANSWER THE FOLLOWING QUESTIONS

11. Are you currently a student actively enrolled in an AuD program? YES NO

If you answered YES to question 11 and you are actively enrolled in an AuD Program, what is your expected graduation date from the AuD program?

- 12.** What is your current or most recent practicum setting?
- a. Clinic/Hospital
 - b. VA/Military/Government
 - c. Medical School, University
 - d. ENT office
 - e. Manufacturer
 - f. Private Practice
 - g. Public School
 - h. Other (please specify): _____
- 13.** What state is your current or most recent practicum setting located in?
- _____
- 14.** What patient population do/did you serve at your current or most recent practicum setting?
- a. Adults only
 - b. Mainly adults (80% or more) with some pediatric patients (up to 20%)
 - c. Fairly balanced representation of adults and pediatric patients
 - d. Mainly pediatric patients (80% or more) with some adult patients (up to 20%)
 - e. Pediatric only
 - f. Don't see patients
- 15.** In a typical week, what services do/did you personally provide at your current or most recent practicum setting (Circle all that apply)
- a. Pure tone audiometry
 - b. Immittance audiometry
 - c. Otoscopy
 - d. Otoacoustic emissions
 - e. Evoked potentials
 - f. ENG
 - g. Other vestibular testing
 - h. Hearing aid dispensing
 - i. Cochlear implants
 - j. Central auditory processing
 - k. Cerumen management

IF YOU ANSWERED QUESTIONS 11-15, SKIP QUESTIONS 16-29 AND PROCEED TO QUESTION 30

Infection Control Practices Within the Professional Setting

- 16.** In your opinion, does your professional setting have a high exposure to communicable disease?
 - a. Yes
 - b. No
 - c. Don't Know
- 17.** In your opinion, is your professional setting associated with at least some risk to cross contamination that could potentially lead to localized infection or disease?
 - a. Yes
 - b. No
 - c. Don't Know
- 18.** Is there a written mandate regarding infection control in your professional setting (i.e., Universal Precautions)?
 - a. Yes
 - b. No
 - c. Don't know
- 19.** Did your current employer provide you with an employee exposure classification at the time of hire?
 - a. Yes
 - b. No
 - c. Don't know
- 20.** Does your clinic have an audiology-specific infection control plan outlining how clinical procedures are to be executed for purposes of minimizing the risk of cross-infection?
 - a. Yes
 - b. No
 - c. Don't Know
- 21.** Are you offered the opportunity to receive vaccinations within your professional setting?
 - a. Yes
 - b. No
 - c. Don't Know
- 22.** Are vaccinations mandated in your professional setting?
 - a. Yes
 - b. No
 - c. Don't Know
- 23.** Are vaccination and immunization records of all employees kept on file?
 - a. Yes
 - b. No
 - c. Don't Know
- 24.** Are post-exposure records documented?
 - a. Yes
 - b. No
 - c. Don't Know

- 25.** Were you provided with training on infection control prior to the provision of clinical services at your current professional setting?
- a. Yes
 - b. No
 - c. Don't Know
- 26.** Were you provided with training on audiology-specific infection control prior to the provision of services at your current professional setting?
- a. Yes
 - b. No
 - c. Don't Know
- 27.** Are there annual training sessions conducted specifically on infection control within your professional setting?
- a. Yes
 - b. No
 - c. Don't Know
- 28.** Are there annual training sessions addressing audiology-related infection control measures within your professional setting?
- a. Yes
 - b. No
 - c. Don't Know
- 29.** Does your clinic have a plan on how to handle accidents including steps to be taken when an accident occurs which can expose individuals to bloodborne pathogens or other potentially infectious agents?
- a. Yes
 - b. No
 - c. Don't Know

IF YOU ANSWERED QUESTIONS 16-29, SKIP QUESTIONS 30-41 AND PROCEED TO QUESTION 42

Infection Control Practices Within Your Current or Most Recent Practicum

- 30.** In your opinion, does your current or most recent practicum setting have a high exposure to communicable disease?
- a. Yes
 - b. No
 - c. Don't Know
- 31.** In your opinion, is your current or most recent practicum setting associated with at least some risk to cross contamination that could potentially lead to localized infection or disease?
- a. Yes
 - b. No
 - c. Don't Know

32. Is there a written mandate regarding infection control in your current or most recent practicum setting (i.e., Universal Precautions)?
 - a. Yes
 - b. No
 - c. Don't know
33. Did your current or most recent supervisor at your current or most recent practicum setting provide you with an employee exposure classification at the time of hire?
 - a. Yes
 - b. No
 - c. Don't know
34. Does your current or most recent practicum setting have an audiology-specific infection control plan outlining how clinical procedures are to be executed for purposes of minimizing the risk of cross-infection?
 - a. Yes
 - b. No
 - c. Don't Know
35. Are you offered the opportunity to receive vaccinations within your current or most recent practicum setting or through the university your are currently enrolled in?
 - a. Yes
 - b. No
 - c. Don't Know
36. Are vaccinations mandated in your current or most recent practicum setting?
 - a. Yes
 - b. No
 - c. Don't Know
37. Are your vaccination and immunization records kept on file at your current or most recent practicum setting?
 - a. Yes
 - b. No
 - c. Don't Know
38. Are post-exposure records documented?
 - a. Yes
 - b. No
 - c. Don't Know
39. Are you provided with training on infection control within your current or most recent practicum setting prior to the provision of clinical services?
 - a. Yes
 - b. No
 - c. Don't Know
40. Are you provided with training on audiology-specific infection control within your current or most recent practicum setting?
 - a. Yes
 - b. No
 - c. Don't Know

- 41.** Does your current or most recent practicum site have a plan on how to handle accidents including steps to be taken when an accident occurs which can expose individuals to bloodborne pathogens or other potentially infectious agents
- a. Yes
 - b. No
 - c. Don't Know

IF YOU ANSWERED QUESTIONS 30-41, SKIP QUESTIONS 42-59 AND PROCEED TO QUESTION 60

- 42.** Do you have access to a sink with running water at your current professional setting?

- a. Yes
- b. No

- 43.** Do you have access to no-rinse hand degermers?

- a. Yes
- b. No

- 44.** Do you wash your hands with soap and running water or use no-rinse hand degermers: (circle either yes or no for each of the following):

- | | | |
|--|-----|----|
| a. After each patient | Yes | No |
| b. After cerumen management | Yes | No |
| c. After earmold impression procedures | Yes | No |
| d. After handling patient's hearing aids with bare hands | Yes | No |
| e. After glove use | Yes | No |
| f. After use of the lavatory | Yes | No |
| g. Pursuant to contact with bodily fluids | Yes | No |

- 45.** Do you have access to gloves in your current clinical setting? Yes No

- 46.** Do you wear gloves during...?

- | | | |
|---|-----|----|
| a. Otoscopy-at all times no exceptions | Yes | No |
| b. Otoscopy but only in the event of a draining ear(s) | Yes | No |
| c. Cerumen management | Yes | No |
| d. Evoked potential assessment | Yes | No |
| e. Vestibular and balance assessment | Yes | No |
| f. Injection of earmold impression material into ear canal | Yes | No |
| g. Earmold impression removal | Yes | No |
| h. Receipt and/or handling of patient's hearing instrument | Yes | No |
| i. Cleaning instruments | Yes | No |
| j. Disinfecting instruments | Yes | No |
| k. Submerging/removing instruments into/from cold sterilant | Yes | No |

- 47.** Do you wear eye protection during...?
- | | | |
|--|-----|----|
| a. Hearing aid modifications | Yes | No |
| b. Cerumen management | Yes | No |
| c. Personal eyeglasses serve as protection | Yes | No |
- 48.** Do you have access to masks in your current work setting? Yes No
- 49.** Do you wear a mask during hearing aid/earmold modification procedures? Yes No
- 50.** Which of the following disposable instruments/devices do you use at your current clinical setting? In this context, disposable instruments/devices are those instruments/devices that are used once with a single patient and then thrown away after use. Circle all that apply
- a. Otoscope specula
 - b. Mechanical instruments for cerumen removal (i.e. curette, loop)
 - c. Real-ear probe tube
 - d. Immittance and/or OAE tips
 - e. Insert earphones
 - f. Headphone covers
 - g. None are applicable
- 51.** Which of the following non-disposable instruments/devices do you use at your current clinical setting? In this context, non-disposable instruments/devices are intended to be reused with multiple patients. Circle all that apply.
- a. Otoscope specula
 - b. Mechanical instruments used for cerumen removal (i.e., curette, loop)
 - c. Real-ear probe tube
 - d. Immittance and/or OAE tips
 - e. Insert earphones
 - f. Headphones
 - g. None are applicable
- 52.** Which of the following instruments/devices do you clean and disinfect after use and prior to reuse? Circle all that apply.
- a. Otoscope specula
 - b. Mechanical instruments used for cerumen removal (i.e., curette, loop)
 - c. Real-ear probe tube
 - d. Immittance and/or OAE tips
 - e. Insert earphones
 - f. Headphone
 - g. None are applicable

- 53.** Which of the following non-disposable instruments/devices do you clean and sterilize prior to reuse? Circle all that apply.
- a. Otoscope specula
 - b. Mechanical instruments used for cerumen removal (i.e., curette, loop)
 - c. Real-ear probe tube
 - d. Immittance and/or OAE tips
 - e. Insert earphones
 - f. Headphone
 - g. None are applicable
- 54.** How often are touch surfaces, such as countertops, arm chair rests, or counseling table surfaces disinfected?
- a. Never
 - b. As needed based on the discretion of the clinician
 - c. After each patient appointment
 - d. At the beginning and/or end of the day
 - e. Once a week
 - f. Once a month
- 55.** How often do you disinfect toys used during pediatric hearing assessments?
- a. Never
 - b. As needed based on the discretion of the clinician
 - c. After each patient appointment
 - d. At the beginning and/or end of the day
 - e. Once a week
 - f. Once a month
 - g. Don't see pediatric patients
- 56.** How often do you disinfect toys that reside in the waiting room or reception area?
- a. Never
 - b. As needed based on the discretion of the clinician
 - c. After each patient appointment
 - d. At the beginning and/or end of the day
 - e. Once a week
 - f. Once a month
 - g. Not applicable

Terminology

- 57.** Removing gross contamination but not necessarily destroying germs is defined as...
- a. Disinfection
 - b. Cleaning
 - c. Sterilization
 - d. None of the above

- 58.** Destroying 100 percent of all vegetative microorganisms and their endospores is termed...
- Disinfecting
 - Cleaning
 - Sterilizing
 - None of the above
- 59.** Destroying everyday germs can be classified as...
- Disinfecting
 - Cleaning
 - Sterilizing
 - None of the above

IF YOU ANSWERED QUESTIONS 42-59, SKIP QUESTIONS 60-77 AND PROCEED TO QUESTION 78

- 60.** Do you have access to a sink with running water at your current or most recent practicum setting?
- Yes
 - No
- 61.** Do you have access to no-rinse hand degermers at your current or most recent practicum setting?
- Yes
 - No
- 62.** Do you wash your hands with soap and running water or use no-rinse hand degermers: (circle either yes or no for each of the following):
- | | | |
|--|-----|----|
| h. After each patient | Yes | No |
| i. After cerumen management | Yes | No |
| j. After earmold impression procedures | Yes | No |
| k. After handling patient's hearing aids with bare hands | Yes | No |
| l. After glove use | Yes | No |
| m. After use of the lavatory | Yes | No |
| n. Pursuant to contact with bodily fluids | Yes | No |
- 63.** Do you have access to gloves in your current at your current or most recent practicum setting?
- Yes No

64. Do you wear gloves during...?

- | | | |
|---|-----|----|
| a. Otoscopy-at all times no exceptions | Yes | No |
| b. Otoscopy but only in the event of a draining ear(s) | Yes | No |
| c. Cerumen management | Yes | No |
| d. Evoked potential assessment | Yes | No |
| e. Vestibular and balance assessment | Yes | No |
| f. Injection of earmold impression material into ear canal | Yes | No |
| g. Earmold impression removal | Yes | No |
| h. Receipt and/or handling of patient's hearing instrument | Yes | No |
| i. Cleaning instruments | Yes | No |
| j. Disinfecting instruments | Yes | No |
| k. Submerging/removing instruments into/from cold sterilant | Yes | No |

65. Do you wear eye protection during...?

- | | | |
|--|-----|----|
| a. Hearing aid modifications | Yes | No |
| b. Cerumen management | Yes | No |
| c. Personal eyeglasses serve as protection | Yes | No |

66. Do you have access to masks in your at your current or most recent practicum setting?

Yes No

67. Do you wear a mask during hearing aid/earmold modification procedures?

Yes No

68. Which of the following disposable instruments/devices do you use at your current clinical setting? In this context, disposable instruments/devices are those instruments/devices that are used once with a single patient and then thrown away after use. Circle all that apply

- a. Otoscope specula
- b. Mechanical instruments for cerumen removal (i.e. curette, loop)
- c. Real-ear probe tube
- d. Immittance and/or OAE tips
- e. Insert earphones
- f. Headphone covers
- g. None are applicable

69. Which of the following non-disposable instruments/devices do you use at your current clinical setting? In this context, non-disposable instruments/devices are intended to be reused with multiple patients. Circle all that apply.

- a. Otoscope specula
- b. Mechanical instruments used for cerumen removal (i.e., curette, loop)
- c. Real-ear probe tube
- d. Immittance and/or OAE tips
- e. Insert earphones
- f. Headphones
- g. None are applicable

- 70.** Which of the following instruments/devices do you clean and disinfect after use and prior to reuse? Circle all that apply.
- a. Otoscope specula
 - b. Mechanical instruments used for cerumen removal (i.e., curette, loop)
 - c. Real-ear probe tube
 - d. Immittance and/or OAE tips
 - e. Insert earphones
 - f. Headphone
 - g. None are applicable
- 71.** Which of the following non-disposable instruments/devices do you clean and sterilize prior to reuse? Circle all that apply.
- a. Otoscope specula
 - b. Mechanical instruments used for cerumen removal (i.e., curette, loop)
 - c. Real-ear probe tube
 - d. Immittance and/or OAE tips
 - e. Insert earphones
 - f. Headphone
 - g. None are applicable
- 72.** How often are touch surfaces, such as countertops, arm chair rests, or counseling table surfaces disinfected?
- a. Never
 - b. As needed based on the discretion of the clinician
 - c. After each patient appointment
 - d. At the beginning and/or end of the day
 - e. Once a week
 - f. Once a month
- 73.** How often do you disinfect toys used during pediatric hearing assessments?
- a. Never
 - b. As needed based on the discretion of the clinician
 - c. After each patient appointment
 - d. At the beginning and/or end of the day
 - e. Once a week
 - f. Once a month
 - g. Don't see pediatric patients
- 74.** How often do you disinfect toys that reside in the waiting room or reception area?
- a. Never
 - b. As needed based on the discretion of the clinician
 - c. After each patient appointment
 - d. At the beginning and/or end of the day
 - e. Once a week
 - f. Once a month
 - g. Not applicable

Terminology

- 75.** Removing gross contamination but not necessarily destroying germs is defined as...
- a. Disinfection
 - b. Cleaning
 - c. Sterilization
 - d. None of the above
- 76.** Destroying 100 percent of all vegetative microorganisms and their endospores is termed...
- a. Disinfecting
 - b. Cleaning
 - c. Sterilizing
 - d. None of the above
- 77.** Destroying everyday germs can be classified as...
- a. Disinfecting
 - b. Cleaning
 - c. Sterilizing
 - d. None of the above

IF YOU ANSWERED QUESTIONS 60-77, SKIP QUESTIONS 78-81 AND PROCEED TO QUESTION 82.

Need for Further Education

- 78.** Throughout your professional career, have you attended at least one educational workshop, short course, lecture, etc., on infection control practices directly related to the audiology clinic?
- a. Yes
 - b. No
- 79.** In the past year, have you attended at least one educational workshop, short course, lecture, etc., on infection control practices directly related to the audiology clinic?
- a. Yes
 - b. No

- 80.** If you attended an infection control workshop, short course, lecture during the course of your career, did the educational experience influence your infection control procedures in the clinical environment?
- a. Yes
 - b. No
 - c. Never attended an infection control course during my career
- 81.** In your opinion, should continuing education for infection control be a mandatory prerequisite to state licensure and national certification?
- a. Yes
 - b. No
 - c. Don't know

IF YOU ANSWERED QUESTIONS 78-81, SKIP QUESTIONS 82-87. YOU ARE FINISHED. THANK YOU FOR TAKING THE TIME TO ANSWER THESE QUESTIONS

Need for Further Education

- 82.** Have you or will you be required by your Audiology program to take a course on infection control?
- a. Yes
 - b. No
 - c. Don't Know
- 83.** Have you or will you be offered at least a lecture on infection control by your Audiology program?
- a. Yes
 - b. No
 - c. Don't Know
- 84.** In the past year, have you attended at least one educational workshop, short course, lecture outside of your University program on infection control practices directly related to the audiology clinic?
- a. Yes
 - b. No
- 85.** If you attended an infection control workshop, short course, or lecture, whether within or outside of your University program, did the educational experience influence your perception of necessary infection control procedures in the clinical environment?
- a. Yes
 - b. No
 - c. Never attended an infection control course during my career

- 86.** Based on your infection control knowledge, as a whole, do you feel that the practicum sites you have been exposed to serve as an excellent model as to how infection control procedures should be implemented in the audiology clinic?
- a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree

COMMENTS:

- 87.** In your opinion, should continuing education for infection control be a mandatory prerequisite to state licensure and national certification?
- a. Yes
 - b. No
 - c. Don't know

IF YOU ANSWERED QUESTIONS 82-87, YOU ARE FINISHED. THANK YOU FOR TAKING THE TIME TO ANSWER THESE QUESTIONS